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Book Title	Digital Education: Out to the World and Back to the Campus	
Series Title		
Chapter Title	The EMMA Experience. Emerging Patterns and Factors for Success	
Copyright Year	2017	
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Abstract	<p>Since 2008, when the first experiment with MOOCs took place, much has been said, written and explored. However, almost ten years later we are unable to say whether MOOCs are really a desirable learning experience and, moreover, what are the factors for success in the MOOC environment. Literature in the field seems to clearly endorse learner engagement and participation as activities that ensure a higher completion rate and a satisfying learning experience, yet a high degree of dropout can be attributed to a request for participation which learners find unsustainable. On many MOOC projects, the data opens opportunities for discussion but provides few answers, as so much depends on individual variables of the specific course. Far from being a limit of the research, this uncertainty is the only way to preserve learning from becoming a hostage of algorithms, thus leaving teachers and learners the freedom to plan, decide, and experience, and to evaluate their teaching and learning.</p>	

Keywords
(separated by '-')

Learning analytics - Learning data - MOOC

The EMMA Experience. Emerging Patterns and Factors for Success

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Abstract. Since 2008, when the first experiment with MOOCs took place, much has been said, written and explored. However, almost ten years later we are unable to say whether MOOCs are really a desirable learning experience and, moreover, what are the factors for success in the MOOC environment. Literature in the field seems to clearly endorse learner engagement and participation as activities that ensure a higher completion rate and a satisfying learning experience, yet a high degree of dropout can be attributed to a request for participation which learners find unsustainable. On many MOOC projects, the data opens opportunities for discussion but provides few answers, as so much depends on individual variables of the specific course. Far from being a limit of the research, this uncertainty is the only way to preserve learning from becoming a hostage of algorithms, thus leaving teachers and learners the freedom to plan, decide, and experience, and to evaluate their teaching and learning.

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1 Introduction

In 2013 the MOOC phenomenon reached new heights. Many observers commented that it was like being «in the midst of a hype cycle» [1, 4, 5], while others feared that it was the overstatement surrounding the phenomenon that would prove their greatest obstacle to success [3]. Expectations were high in Europe too, but accompanied by a certain apprehension regarding the future of public universities and the way competition is increasing between old and new players for a position in this open and global education market. 2013 also marked the moment for new platforms to explore the European market. This was the case for the French FUN and the English FutureLearn, the first strongly supported by the government, the second by the Open University and other relevant stakeholders. One year later, after exploratory research based on a survey at a European Level [2], and thanks to EU funds, the EMMA project (European Multiple MOOC Aggregator: www.europeanmoocs.eu) came into being to create an innovative platform for MOOC delivering in a variety of European languages and pedagogical approaches.

In this paper we focus on the data and look at some of the results emerging from cross-referencing of the learning analytics data, survey results, and qualitative observations, which enabled us to identify four main variables as key ingredients in a successful MOOC.

2 Methodology

The diverse and multi-faceted approach of EMMA provided a broad range of data from which to extrapolate information to make sense of the MOOC project. A solid and tested Evaluation Methodology of the processes of learning and of learners' behavior was obtained by cross-referencing two sources.

- The **Learning Analytics dashboards**, with real time data, which were made available to both teachers and learners during the course of the MOOCs.
- The **social survey-based analysis, which** includes 3 main steps:
 - A profiling of the students registering on the platform, via a combination of two tools: the **registration form**, collecting basic data (gender, age, profession, nationality, main language) and the **registration questionnaire (EXPECTATIONS)**, collecting more detailed info (e.g. previous experience with e-learning, expectations vs. EMMA, etc.). The target of this survey includes all people registered.
 - A MOOC-Level questionnaire, adapted to each single MOOC, on course completion to evaluate the MOOC experience and to obtain feedback on the learning experience.
 - An Exit Questionnaire, which evaluates the experience on the platform. The target of this survey includes all people registering in at least one MOOC. Taking the survey was never mandatory, to avoid interference with course progress and/or learner fatigue.

2.1 Universe of Learners

The survey data were connected with Learning Analytics via the Unique Identification string. Learners were clustered as Enrolled, Observers or Contributors according to their level of commitment to the course as explained below. The universe of learners for this analysis was equal to 15.522.

Enrolled – participants who entered the MOOC up to five times: 5.708 or, 36.8%.

Observers – participants who entered the MOOC more than five times, but did not interact with the content or other participants: 3.939 or, 25.4%.

Contributors – participants who contributed with the assignment, comment or post to the MOOC at least once: 3.999 or, 25.7%.

Actives – participants who contributed with the assignment, comment or post to the MOOC more than once: 1.876 or, 12.1%.

3 Results of the User Surveys

The data reported and commented in this section refer to a sample of 1.483 individuals, i.e. 6% of the 23.800 profiles registered on the EMMA platform at the time of the last data dump (June 2016). This is a self-selected sample given the non-mandatory nature of all the surveys; the respondents have been selected as having submitted a complete set of data, i.e. both at registration and at expectation levels.

3.1 Distribution of Enrolments

The MOOCs which most appealed to the learners and therefore collected most of the enrolments are fairly diverse and presented by very diverse academic institutions. Besides the #OWU MOOC (which totaled over 2000 enrolments) and the course on *Adolescent Brain* (over 1.500 enrolments) both offered by EMMA Partners, two non-partner MOOCs around digital culture were definitely successful: *Coding in Your Classroom Now!* by A. Bogliolo (University of Urbino, Italy, 14.000 learners enrolled), and *Digital Libraries in Theory and Practice* by A. Tammaro (University of Parma, Italy – over 1200 enrolled students).

3.2 Opinion on the Experience with the MOOC Enrolled in

91% of EMMA learners found the learning experience an enjoyable one (+6% on previous round). 92% of the learners claimed that their course was well organized (+14%), which made the task of following it easy enough for 89% (+11%). This can be attributed to the care that the teachers and tutors took in designing their MOOC.

Opinions regarding quantity, quality and type of materials was positive (over 85% of users completely or fairly agreed that materials were “up-to-date”, “appropriate”, “engaging” and “innovative”), and registered little variation between different learner clusters, although the more opportunities the learners had to get familiar with the materials, the better their evaluation.

3.3 Opinion on the Quantity and Acceptance of Tasks and Assignments Proposed in the MOOCs

86% of respondents (+9% vs. 2015) found that the quantity of tasks and assignments requested of learners was just right considering the time they put in and what they got out of the task. Learners found the tasks and assignments useful (89%) and engaging (85%), and a good opportunity for self-assessment (88%). Moreover, 73% of the respondents enrolled in at least one EMMA MOOC claimed that they received the expected feedback from tutors and teachers (Fig. 1).

The difference in perception is more evident within the clusters, while the number of MOOCs followed doesn't seem to influence learner judgment significantly.

What about the **quantity of the tasks and assignments** which were requested to you?
Did you find that...?



Fig. 1. Evaluation of assignments requested (data from the exit questionnaire)

3.4 Opinion on Interaction Tools

Over 2 out of 3 respondents claim that the conversation and chat functions are useful, productive, engaging and that they encouraged them to reflect. These functions are appreciated by the most active learners, with intensive MOOC users finding them a useful tool for creating connections.

3.5 Opinion on Video Materials

Over 90% of the respondents describe the videos as useful, of good quality and format, and enhancing the overall value of the MOOCs. Almost 2 out of 3 stated they are the right length and appreciated the subtitling. Again, these updates show a positive trend in increased appreciation. The length of videos apparently impacted learner willingness to remain on board. 41% of Enrolled learners found videos too long, so their participation might have been hindered by this. However, the main feature discriminating the high and low “users” of EMMA courses where video is concerned, is the availability of subtitles, which is seen as a further support in the learning process.

3.6 The Personal Blog

Respondents are generally satisfied with the availability of the personal blog: 61% stated it is useful, 57% engaging and 59% stated that it is a good opportunity for getting in touch with the other learners. 30% to 40% of learners could not express an opinion since they hadn’t used the function (either because it wasn’t expressly required, or it wasn’t promoted by teachers/tutors). Once again, the most interactive learners fully appreciated the social potential of the function.

3.7 Personalisation Features

65% of the respondents found the personalisation features – Bookmarks, Notes and Comments, - useful and easy to use. 64% stated that they represent a good opportunity to track the relevant points of lessons. Values were 20% higher than on previous analysis.

3.8 Opinion on Topics for Future MOOCs

A wide variety of topics and subjects were mentioned as areas of interest by the respondents but digital skills for teachers, language learning and computer programming were amongst the most popular.

4 Learning Analytics Results¹

4.1 Interactions Analysed

For analysing participants' interactions, data from Learning Locker and EMMA database were used. The following interactions were analyzed for learning analytics purposes:

- Learner visited page (lesson, unit, assignment, blogpost)
- Learner created post
- Learner commented/replied conversation
- Learner submitted assignment/peer-assessment
- Duration of different content

In order to make sense of the learning analytics data, the analysis results were compared with the intended MOOC design in the platform (Table 1).

One of the main results of the analysis indicates that it is almost impossible to say that shorter courses are more efficient than longer courses, as is sometimes suggested in MOOC research communities. One of the most successful MOOCs in the EMMA platform was *Coding in your classroom, NOW!* which lasted 13 weeks - the longest MOOC ever on Emma. It recorded the largest no. of participants ($n = 6951$ at the time of data collection) and it is interesting to note that the number of *enrolled* learners was only 27%.

Smart Toys for Smarter Kids is another good example. It lasted 12 weeks, yet more than 30% of the participants ($n = 937$) contributed to the MOOC and the number of *enrolled* learners was less than 40%. At the same time, several shorter courses were running where the number of learners who only enrolled on the course was pretty high (more than 70%) and, vice versa, the percentage of learners who actually contributed to the MOOC was rather low.

4.2 MOOC Designs

A further investigation into the different platform functionalities and activities used in individual MOOCs illustrates that EMMA was able to support different pedagogical approaches as shown in the table below.

At the same time it demonstrates that it is not possible to say if one kind of MOOC design is better than another. The MOOC "Designing online courses with 7Cs framework" design was mainly built on one functionality – conversation. Learners had a variety of options to use that tool for discussion, presenting tasks, asking questions, reviewing peers' and so on. Table 2 indicates that the number of only enrolled users is pretty high and only 15% of the learners actually contributed to the MOOC activities. A social network analysis of the same course showed that very few learners interacted with their classmates.

¹ For this paragraph, we thank Kairit Tammets (University of Tallin) for providing data and comments.

Table 1. Clusters distribution in the MOOCs analysed Oct 2015–July 2016

No. of participants	Duration	Enrolled	Observer	Contributor	Active
Drawing lights and shadows (n = 146)	4 weeks	57%	13%	15%	15%
Digital library in principle and practice (n = 726)	4 weeks	3%	25%	18%	14%
Circular economy (n = 74)	4 weeks	65%	9%	11%	15%
Lisbon and the sea: a story of arrivals and departures (n = 131)	5 weeks	58%	24%	15%	3%
Open Wine University (two runs together, n = 2512)	5 weeks	37%	12%	22%	29%
Copyright – DIY (n = 156)	6 weeks	67%	21%	11%	0.6%
Designing online courses with the 7Cs framework (n = 403)	6 weeks	71%	13%	8%	7%
21st century learning (n = 359)	6 weeks	64%	13%	12%	11%
The organisation of cultural enterprises (n = 292)	6 weeks	90%	2%	4%	4%
Climate changes: the context of life experience (n = 117)	9 weeks	78%	(9%)	(8%)	5%
Search in the internet (n = 186)	9 weeks	48%	12%	10%	30%
Computer-assisted Inquiry (n = 61)	9 weeks	57%	26%	13%	–
Assessment for learning in practice (n = 326)	8 weeks	39%	25%	36%	–
Adolescent brain (n = 1593)	8 weeks	34%	13%	35%	23%
FlotRisCo: seaside communities facing coastal risks (n = 77)	8 weeks	58%	42%	–	–
Guerrilla literacy learners (n = 69)	7 weeks	65%	13%	19%	3%
Coding in your classroom (n = 6951)	13 weeks	27%	34%	32%	7%
Piattaforme digitali per la gestione del territorio (n = 405)	13 weeks	45%	50%	20 (5%)	–
Smart toys for smarter kids. Becoming a digital educator (n = 937)	12 weeks	38%	30%	29%	3%

The MOOC “Search in the internet” also used mainly one EMMA functionality – quizzes. Learners were expected to read or watch learning resources and then they submitted quizzes. The course was pretty capacious – 92 units and 61 quizzes is not an easy task. Further investigation of data demonstrated that:

- Only 3% (5 learners) visited all the 92 units;
- Only 10% (19 learners) visited at least 50% of the quizzes (31 quizzes);
- Only 9% (16 learners) submitted at least 50% of the quizzes;

Clustering of the participants demonstrated that ca. 50% of the learners became MOOC participants and 40% actually submitted quizzes.

The third example comes from the most popular MOOC – Coding in your classroom NOW. That MOOC used several EMMA functionalities: blogs, conversation, assignments, quizzes, peer-assessment, and external resources. Clustering demonstrates

Table 2. Comparison of MOOC design

	Search in the internet	Coding in the classroom now!	Designing online courses with 7Cs framework
N. of weeks	9	13	6
N. of lessons/units/ assignments	9/92/61	6/23/9	6/25/0 No assignments
Learning activities	Read materials Watch videos Submit quiz	Read materials Practical tasks outside platform Submit assignments (link tasks) Peer-assessment	Read materials Watch videos Practical tasks outside platform Reflect and comment in blog or conversation tool
Possible pedagogy	xMOOC	hybrid MOOC	cMOOC
Clusters of participants			
• Enrolled	48%	27%	71%
• Observers	12%	34%	13%
• Contributors	30%	32%	8%
• Active	10%	7%	7%

that nearly 40% of the participants contributed to the MOOC and less than 30% were just enrolled, which is really a good result for quite a massive MOOC. Further investigation demonstrates that 24% of the participants actually visited all the units and 33% of the participants visited at least 50% of the assignments.

4.3 Overview of Participants' Engagement in MOOCs

See Figs. 2 and 3.

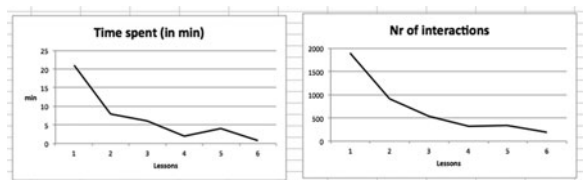


Fig. 2. 'Designing online courses with 7Cs framework': time spent and interactions in lessons

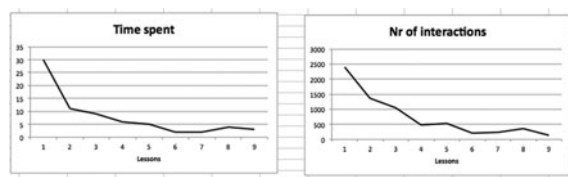


Fig. 3. 'Search in the internet': time spent and interactions in lessons

4.4 Clusters of Participants

Lesson engagement was also compared in relation to learner types. In the figure below, we can see an example of a course with 58% of the learners contributors or active learners, the “Adolescent brain “MOOC (Fig. 4).

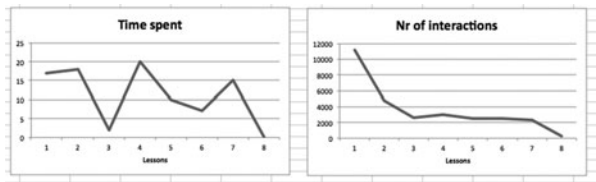


Fig. 4. Adolescent brain: time spent and interactions in lessons.

From these figures it is possible to assume that certain lessons were more time-consuming or interesting than others (lesson 2, 4, 7). It is also possible to see that interactions remained basically the same from lesson 3 onwards, though the same initial drop-off was recorded.

5 Conclusions

In this paper we briefly presented and discussed the cross analysis of survey data with LA clusters, which prove both that an intensive interaction with the platform is one of the keys to satisfaction and, possibly, to learner retention, and, on the contrary, that successful relationship with the teacher and the MOOC design have an impact on the number of interactions with the platform. Expectations about the interactions within the platform were in fact rather high (75% stated they wanted to learn on EMMA by discussing with teachers/tutors, 67% by reading comments posted by other learners, and 61% by discussing with other learners), and the tools and functions made available by the platform responded well to their requirements, together with the opportunity of building a personal learning environment offered by the Coursebook functions.

Data from the Exit questionnaire were also crossed with LA data regarding learners enrolled in more than one MOOC, demonstrating that there is a connection between learner satisfaction and repeat enrollment (Fig. 5).

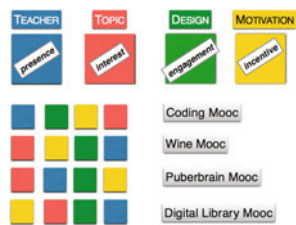


Fig. 5. The recipe for MOOC success

We can state that there is not a unique recipe for success: MOOCs can be designed very differently using only the functionalities that are strongly necessary to support learning. We have identified four main variables as key ingredients of a successful MOOC. These components are the teacher presence (teaching, cognitive, social), the topic (socially or professionally interesting), the course design (how engaging the mix of materials and learning activities proves to be) and motivation (whether the course offers necessary credits or training in a necessary skill). Although these components are not to be considered as enabling factors - i.e. they cannot be put in place at the beginning of the learning to ensure success - they do all appear in a varying sequence in the most successful MOOCs.

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